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Sexual partner change and condom use among urban factory workers in northwest Tanzania

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Abstract

***Objective*—To describe sexual partner change and condom use at the intake of a cohort study of urban factory workers in Tanzania.**

***Methods*—From October 1991 to March 1992, 926 male and 170 female factory workers were interviewed using a structured, pre-coded questionnaire. Questionnaire reliability was assessed by pre-testing and comparison with results of unstructured interviews and carrying out repeat questionnaires on a sub-sample.**

***Results*—Almost half of both men and women had had sexual intercourse by their 17th birthday. The period of premarital sex had an interquartile range of 2 to 10 years in men and 0 to 2·5 years in women. Having had sexual intercourse in the past month with more than one partner was reported by 22% of the men and 5% of the women. Factors associated with multiple partners in men were being born in or near Mwanza Region, having low education and low income, and being married. Condoms had been used in the past month by 3% only, mainly with casual partners. Condom use in men was associated with being young, living in town, being born in Kagera Region, high education and high income, being circumcised, and having casual or steady (non- marital) partners.**

***Conclusion*—Information, education and communication (IEC) on sexual relationships and condom use should start at an early age, and include education at primary schools. Much sexual partner change appears to occur through steady (non-marital) partnerships, indicating the need for IEC to be expanded beyond groups such as commercial sex workers and their clients.**

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Introduction

HIV-1 infection is more common in heterosexuals in Eastern and Southern Africa than in Europe and the U.S.[1] Within these countries HIV-1 infection usually has a higher prevalence in urban than in rural areas,[1–6] as have other sexually transmitted diseases (STDs).[1 7] A higher rate of heterosexual partner change in more affected areas could be an important determinant of this increased prevalence.[1] Extensive quantitative information on sexual partner change and condom use has recently been collected in Europe because of the HIV epidemic,[8–10] but in Africa available information is still limited.

A cohort study of urban workers was initiated in a factory in Mwanza Municipality, Tanzania, in order to identify risk factors for HIV-1 seroconversion and for contracting other STDs. A second objective was to document changes in risk behaviour, in particular with respect to condom use and partner change after starting an intervention programme, and to determine whether these changes were associated with a reduced incidence of HIV-1 and other STDs.

In this paper quantitative results are reported at intake regarding sexual behaviour, in particular having multiple sexual partners and use of condoms. This intake took place from October 1991 to March 1992. The main aim of this analysis was to describe baseline information before interventions were undertaken at the factory, and to identify priorities for intervention. In a separate paper qualitative results are presented on the cultural and social background to the findings on sexual behaviour, risk perception, and behavioural change.[11]

Methods

Study population

The study population comprised workers at a large urban factory with a work force of 1728 workers, 13% of whom were female. All workers were invited to enrol from the start of the study. A study clinic was created at the factory in addition to an existing clinic, as the latter was too small to cope with additional activities. Prior to starting the study, the willingness of the study population to participate was determined through an anonymous, self-administered questionnaire which produced a positive response of more than 90%. The study population has been advised that the aim of the study is to determine the health status of the workers, with special interest in sexually transmitted diseases and HIV-1 infection.

Pre- and post-HIV-test counselling was offered to all. Free treatment was provided to all study participants. Condoms were distributed free of charge by all staff present at the clinic. Where necessary, patients were referred to hospital for further investigation or treatment.

Data collection techniques

All respondents were interviewed in a private room for 30 to 45 minutes in Kiswahili by trained interviewers, using a structured and pre-coded questionnaire which was slightly different for men and women. The questionnaire covered demographic and socio-economic variables, health and sexually transmitted diseases, sexual partners and condom use, and finally sexual techniques. For the construction of the questionnaire, use was made of information from qualitative research both within the same Region and elsewhere in Tanzania.

Through pre-testing a number of modifications were made, both in the ordering of questions and in the content. In particular questions on sexual techniques other than vaginal sexual intercourse were found to cause embarassment. Questions on oral-genital sexual contact were omitted, and questions on anal intercourse and masturbation put at the end of the questionnaire. Questions on types of sexual partners, frequency of sexual contact, and use of condoms proved to be less sensitive.

In the questionnaire a distinction was made between four types of partners: (1) spouse, (2) a partner one lives with but is not married to, (3) a steady partner one is not married to and does not live with, and (4) a casual partner. The last of these was defined by one respondent as "a strange face with whom who have sex once and then forget"[11]; in the questionnaire a casual partner was defined as any sexual partner not considered by respondent to be a steady partner. For further information on these different types of partners we refer to Nnko *et al.*[11] As fewer than 1% of respondents reported having a partner in group (2), this type of partner has been considered as spouse in the analysis. Group (3) will be referred to in this paper as steady partner. After the interview respondents were physically examined, counselled, and bled for serological testing.

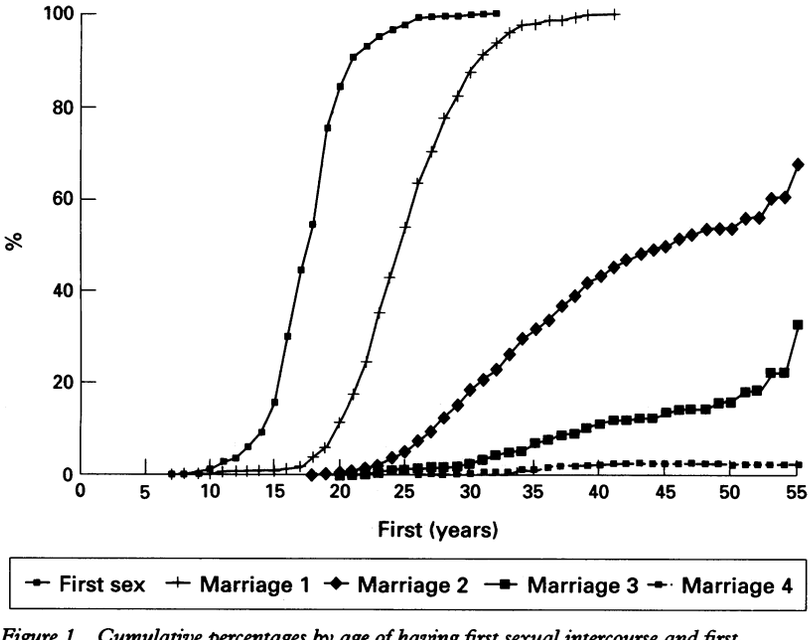

Figure 1 Cumulative percentages by age of having first sexual intercourse and first, second, third, and fourth marriage in 926 male factory workers.

Data analysis

Data were analysed separately for males and females. Interquartile range (IQR) has been used as a measure of dispersion for skewed distributions. Survival analysis was used to determine the age of starting sexual intercourse, age at marriage, and the duration of marriage. Comparisons between survival curves were tested for statistical significance with the log rank test.[12] Stepwise logistic regression was used to simultaneously adjust for various variables of interest. Variables were eligible for inclusion in the regression model if they were a priori thought to be of interest (for example, age) or showed an association with sexual partner change or condom use on univariate analysis. In order to assess the repeatability of responses, repeat questionnaires were administered on a subsample. In addition, a comparison was made with responses obtained from unstructured or semi-structured interviews by social scientists. For most variables a good repeatability could be demonstrated (kappa > 0·80). However, for some variables such as religion repeatability was only moderate (0·5 < kappa < 0·8), perhaps because changing churches is not uncommon. For information on casual partners repeatability was good for contacts less than a month ago, but only moderate for contacts more than a month ago.

Results

In the first 19 weeks of the study 1096 workers (926 male, 170 female) were enrolled, comprising 62% of the male and 76% of the female work force. In comparison with the data on all factory workers, study participants were more likely to be aged below 25 years (18% vs 10%).

Age at first sexual intercourse and at first marriage

The age distribution at first sexual intercourse is presented in fig 1 for men and fig 2 for women. By the 15th birthday 16% of male and 6% of female respondents reported having had sexual intercourse; by the 17th birthday these percentages were 44% and 33% respectively. By the 19th and 21st birthday 75% and 91% of men and women reported having had sexual intercourse respectively. Little difference was observed between men and women (log rank test χ_1^2 1·4, p > 0·25). Secular changes in the age at first sexual intercourse were not observed.

The cumulative age distribution at first and consecutive marriages is also presented in figs 1 and 2. By their 21st birthdays 21% of men and 46% of women had married. Women have their first marriage at a younger age than men (log rank test χ_1^2 17·9, p < 0·0001). Overall, 0·2% of men and 23·5% of women in this study population had not yet married by the age of 40 years.

In those who had ever married, the median period of having had premarital sexual intercourse (that is, the difference between the age at first marriage and the age at first sexual

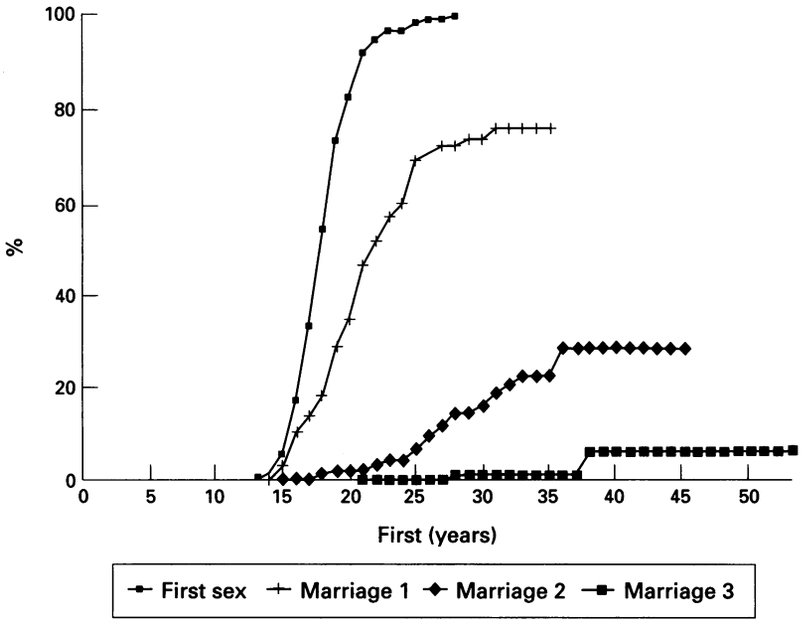

Figure 2 Cumulative percentages by age of having first sexual intercourse and first, second, and third marriage in 170 female factory workers.

intercourse) was 5 years (IQR 2 to 10 years) in men and 1 year (IQR 0 to 2·5 years) in women.

Second and third marriages were more common among men than women (figs 1 and 2). By their 45th birthday 52% of men and 28% of women had married for a second time. By their 55th birthday, 33% of men and 6% of women had married for a third time. For women all second and third marriages took place after previous marriages had ended. Men had no spouse from an earlier marriage at the time of their second and third marriage in 223/280 (80%) and 53/70 (76%) of these marriages respectively.

Stability of marriage

The probability for a marriage to end (by divorce or death of the partner) was estimated to be 4% per year in the first 5 years of marriage, 2% over the next 5 years and 1% per year over the next 10 years. Marriage survival was slightly longer for men than for women (log rank $\chi_1^2 = 2{\cdot}9$, $0{\cdot}05 < P < 0{\cdot}1$). The survival curves were similar for first and second marriages (log rank $\chi_1^2 = 0{\cdot}6$, $P > 0{\cdot}25$). Five years after the wedding 18% of marriages have ended. After 10 years 27% of marriages have ended.

Table 1 Distribution of having various types of partners in 926 male and 170 female urban factory workers

	Number (%)		
	Steady partner* (one or more) with whom sexual intercourse took place in past month	Casual partner† within	
		past 4 weeks	past 12 months
Males			
Married	147/724 (20%)	44/724 (6%)	150/724 (21%)
Single	61/149 (41%)	29/149 (19%)	81/149 (54%)
Married but living apart, separated, or widowed	20/53 (38%)	5/53 (9%)	22/53 (42%)
Females			
Married	6/76 (7%)	0/76 (0%)	5/76 (5%)
Single	27/61 (45%)	1/61 (2%)	8/61 (13%)
Married but living apart, separated, or widowed	10/33 (29%)	1/33 (3%)	5/33 (14%)

*A steady partner is defined as a sexual partner other than a spouse one has a relationship with for some length of time.
†A casual partner is any sexual partner who is not a spouse or steady partner.

Marital, steady, and casual partners

At the time of interview 724/926 (78%) of the male and 76/170 (45%) of the female factory workers were married and living together with their spouse. Of the 724 married men 45 (6%) had two wives, the others had one wife only. Among the married respondents 607/717 (85%) of the men and 71/76 (93%) of the women reported having had sex with their spouse in the past four weeks (men: median 4 times, IQR 2 to 8; women: median 5, IQR 2 to 9).

Having one or more (non-marital) steady partners was reported by 294/926 (32%) of men and 75/170 (44%) of women, and was more common among those not currently married (table 1). Among the respondents with one or more steady partners 228/294 (78%) of the men and 43/75 (57%) of the women reported having had sex with their steady partner in the past 4 weeks (men: median 3 times, IQR 2 to 5; women: median 1, IQR 1 to 2). The median duration of reported current steady partnerships was 7 months (IQR 4–18 months) for men and 24 months (IQR 12–36 months) for women. Men were usually older than their female steady partner. Men of all ages had steady partners, while 351/364 (96%) of their female partners were aged less than 35 years. The male steady partners reported by women were in all age groups.

Having ever had a casual sexual partner was reported by 654/926 (71%) of men and 63/170 (37%) of women. 253/925 (27%) of men and 18/170 (11%) of women had had a casual partner within the past 12 months, again more commonly among those not currently married. Only 15/253 (6%) of men and 1/18 (6%) of women stated they met the casual partner in a bar. The rest were met "on the street" (men 167/253 [66%], women 5/18 [26%]), at a friend's house (men 24/253 [9%], women 5/18 [28%]), or at a party (men 13/253 [5%], women 2/18 [11%]). Other, less frequent possibilities included wedding or burial ceremonies and discos. More information on meeting places with casual partners is given by Nnko *et al.*[11]

Determinants of having multiple partners in men

Having had more than one sexual partner (including the spouse where applicable) in the past month was reported by 205/926 (22%) of men and 8/170 (5%) of women. Determinants of having multiple sexual partners among men are presented in table 2. The group of women was too small for such detailed analysis.

Having more than one sexual partner was reported by 179/724 (25%) of married men, 22/149 (13%) of single men, and 4/53 (8%) of those who were married but living apart, or were separated or widowed (table 2). Of the 179 married men with more than one sexual

Table 2 Determinants for having had more than one sexual partner in the past month in 926 male urban factory workers

Risk factor	*Number with 2+ sexual partners/ Nr seen (%)*	*χ^2† test*	*Odds ratio (95% CI) Crude*	*Adjusted for significant factors**
Age (year)				
15–24	25/146 (17)	p > 0·05	1	1
25–34	77/297 (26)		1·7 (1·0–2·8)	1·3 (0·7–2·6)
35–44	75/350 (21)		1·3 (0·8–2·2)	0·4 (0·2–0·9)
45 +	28/133 (21)		1·3 (0·7–2·3)	0·8 (0·4–0·7)
Residence				
Mwanza Municipality	175/826 (21)	p > 0·05	1	1
Outside Municipality	28/94 (30)		1·6 (1·0–2·5)	1·1 (0·6–1·7)
Birth place				
Mwanza Region	153/557 (27)	p < 0·001	1	1
Shinyanga/Mara	37/164 (23)		0·8 (0·5–1·2)	0·7 (0·5–1·1)
Kagera	3/39 (8)		0·2 (0·1–0·7)	0·4 (0·1–1·2)
Other	12/166 (7)		0·2 (0·1–0·4)	0·2 (0·1–0·5)
Marital status				
Married	179/724 (25)	p < 0·001	1	1
Never married	22/149 (15)		0·5 (0·3–0·9)	0·6 (0·3–1·3)
Married but living apart, separated, or widowed	4/53 (8)		0·2 (0·1–0·7)	0·3 (0·1–0·8)
Education				
<5 yr primary	24/88 (27)	p = (0·01)	1·2 (0·7–2·0)	1·1 (0·6–1·8)
5–7 yr primary	168/717 (23)	trend:	1	1
secondary education	13/121 (11)	p < 0·01	0·4 (0·2–0·7)	0·5 (0·3–1·0)
Income per capita†				
<1500	57/186 (31)	p < 0·001	1	1
1500-	43/176 (24)	trend:	0·7 (0·5-1·2)	0·7 (0·4-1·2)
2000-	43/168 (26)	p < 0·001	0·8 (0·5-1·2)	0·8 (0·5–1·4)
2500-	31/152 (20)		0·6 (0·4-1·0)	0·7 (0·4-1·2)
3500-	30/239 (13)		0·3 (0·2-0·5)	0·5 (0·3-0·8)

*Factors adjusted for in logistic regression were age, birthplace, marital status, education, and income per capita.
†(monthly household income in Tanzania shilling)/(number of adults + 1/2 number of children).

partner only 33 (18%) had had sex with more than one spouse; the other 82% had had extramarital relationships. Factors associated with having had multiple sexual partners in the past month (after adjusting for the other significant variables in logistic regression) were: being born in Mwanza or the neighbouring Mara or Shinyanga Regions, having had less education or having a low income, and being married. Having had more than one

Table 3 Condom use ever and condom use last month by risk factor in 926 male urban factory workers

	Condom use ever			*Condom use last month*		
Risk factor	*Nr using/ Total (%)*	*Crude OR (p-value)*	*OR (95% CI) adjusted for significant factors**	*Nr using/Total (%)*	*Crude OR*	*OR (95% CI) adjusted for significant factors†*
Age (years)						
15–24	46/145 (32)	1 (p < 0·001)	1	9/145 (6)	1 (p < 0·05)	
25–34	48/297 (16)	0·4	0·5 (0·3–0·9)	9/296 (3)	0·5	
35–44	40/349 (11)	0·3	0·4 (0·3–0·8)	10/483 (2)	0·3	
45 +	7/133 (5)	0·1	0·3 (0·1–0·7)			
Residence						
Municipality	135/824 (16)	1 (p > 0·05)	1	27/824 (3)	1 (p > 0·05)	
Outside municipality	4/94 (4)	0·2	0·3 (0·1–1·0)	1/94 (1)	0·3	
Having had sex with casual partner						
Past month	25/78 (32)	3·8	3·5 (1·9–6·4)	11/77 (14)	13·4	13·1 (4·8–35·8)
1–4 months	34/111 (31)	3·6	3·2 (1·9–5·4)	7/111 (6)	5·5	5·7 (1·9–17·0)
>4 months ago or never	81/734 (11)	1 (p < 0·001)	1	9/735 (1)	1 (p < 0·001)	1
Having had sex with steady partner past month						
Yes	49/227 (22)	1·8	2·1 (1·3–3·3)	15/227 (7)	3·7	5·9 (2·4–14·6)
No	92/697 (13)	1 (p < 0·001)	1	13/697 (2)	1 (p < 0·001)	1
Education						
<5 year	2/87 (2)	0·2	0·2 (0·0–1·2)	18/803 (2)	1 (p < 0·001)	1
5–7 year	96/716 (13)	1 (p < 0·001)	1			
secondary	43/121 (36)	3·6 (trend: p < 0·001)	3·5 (2·2–5·8)	10/121 (8)	3·9 (trend: p<0·01)	4·4 (1·8–10·8)
Income per capita†						
<1500	19/185 (10)	1 (p < 0·001)	1	5/186 (3)	1 (p > 0·05)	
1500-	14/176 (8)	0·8	0·9 (0·4-2·0)	2/175 (1)	0·4	
2000-	16/168 (10)	0·9	1·0 (0·5-2·2)	4/168 (2)	0·9	
2500-	29/151 (19)	2·1	2·1 (1·1-4·3)	6/151 (4)	1·5	
3500-	61/239 (26)	3·0 (trend: p < 0·001)	1·8 (1·0–3·5)	11/239 (5)	1·7	
Circumcision						
Yes	88/429 (21)	2·2	1·7 (1·1–2·5)	16/431 (4)	1·5	
No	53/495 (11)	1 (p < 0·001)	1	12/493 (2)	1 (p > 0·05)	
Genital discharge last						
Never	67/509 (13)	1 (p < 0·01)		14/510 (3)	1 (p < 0·05)	1
4 months +	57/364 (16)	1·2		9/363 (2)	0·9	0·5 (0·2–1·4)
<4 months/now	17/51 (33)	3·3 (trend: p < 0·001)		5/51 (10) (trend: p < 0·05)	3·9	3·7 (1·1–12·2)
Birth place						
Mwanza	62/556 (11)	1 (p = 0·001)		13/556 (2)	1 (p < 0·01)	1
Shinyanga/Mara	31/164 (19)	1·7		5/163 (3)	1·3	1·1 (0·3–3·5)
Kagera	12/39 (31)	3·5		5/39 (13)	6·1	6·7 (1·7–25·6)
Other	36/165 (22)	2·2		5/166 (3)	1·3	1·6 (0·5–5·3)
Marital status						
Married	85/723 (12)	1 (p < 0·01)		14/722 (2)	1 (p < 0·005)	
Single	49/148 (33)	3·7		11/149 (7)	4·0	
Married but living apart, separated, or widowed	7/53 (13)	1·1		3/53 (6)	3·0	

*Significant factors adjusted for in logistic regression were age, residence, education, income, circumcision, having had sex with a steady partner, and having had sex with a casual partner.
†Significant factors adjusted for in logistic regression were birthplace, education, having had sex with a steady partner, and having had sex with a casual partner.
‡(monthly household income in Tanzania shilling)/(number of adults + 1/2 number of children).

sexual partner in the past month was also associated with having ever had a genital discharge. This was not included in the regression model as it was thought to be a consequence rather than a determinant of sexual partner change.

Determinants of condom use in men

Overall, 141/924 (15%) of men and 30/170 (18%) of women had ever used a condom. Only 28/924 (3%) of men and 5/170 (3%) of women had used a condom in the past month. A number of determinants of condom use in men were identified (table 3). The group of women was too small for this analysis.

Factors associated with condom use in men after adjusting for the other significant variables in logistic regression were being in the younger age groups, living within the municipality, having had sexual intercourse with a casual or steady partner, having a higher level of education, having a higher income, having had a recent genital discharge, being circumcised, and being born in Kagera (a neighbouring Region with a high prevalence of HIV-1 infection). Condoms were used most frequently with casual partners (18% of sexual contacts), much less with steady partners (2%), and hardly with spouses (0·2%).

Neither sexual partner change, nor condom use was found to be associated with the religion of respondents.

Discussion

This study shows that high risk behaviour in this group of factory workers was widespread, in particular among men; 22% of male workers reported having had more than one sexual partner in the past month, 97% had not used a condom at all in the past month, and 85% reported they had never used them in their life.

It is difficult to assess the validity of self-reported sexual behaviour. Age at first sexual intercourse may have been misreported due to recall bias, or because of a tendency to give socially desirable answers. The direction of the latter bias is likely to have been towards higher ages at first sexual intercourse, in particular among women. If this bias has occurred, the period of premarital sexual intercourse will have been underestimated.

During pre-testing, people reported to be at ease answering questions on partner relations (but not questions on sexual techniques). Having had multiple partners in the past month was reported by a large proportion of men (22%), but less so by women (5%). In men it was associated with having a genital discharge or genital ulcer at physical examination (unpublished data), suggesting that this high risk behaviour is reported with some accuracy. As women are not socially expected to have many sexual partners, in particular not when they are married, this may have biased (that is, reduced) the number of sexual partners reported by women.

Further validation studies are needed. Validation of self-reported sexual behaviour has been attempted in various studies aiming at quantifying risk behaviour for STDs and HIV, with encouraging results.[13–18] However, very few such studies appear to have been carried out in Africa, and much more work on this issue is needed.[19]

A limitation of the study is self-selection bias, as 37% of workers had not (yet) enrolled at the time of this analysis. The direction of this analysis is uncertain: those declining to participate might have had increased risk behaviour (and be afraid to be tested for HIV-1 and other sexually transmitted diseases) or reduced risk behaviour (and have less interest in being tested for sexually transmitted diseases).

Age at first sexual intercourse in this study is similar to that reported from other countries in Africa,[20–22] Haiti,[23] and Europe,[8 10 24] starting in the mid-teens in both sexes, and with a period of premarital sexual intercourse of several years in most men and a substantial proportion of women. Contrary to findings in Europe,[9] no evidence was found for a shift over time towards younger ages for first sexual intercourse. IEC on sexual relationships and condom use should therefore start before the mid-teens and preferably include education at primary schools.

Rates of acquisition of marital partners and marital breakdown appear to be small in comparison with the rates of acquisition and breakdown of steady and casual partnerships. Polygamy only plays a minor role in sexual partner change in this population. Follow-up is expected to provide more information on the relative contribution of marital partner change to overall partner change. Female factory workers were less likely to get married, and after marriage were more likely to divorce than male workers. Female factory workers appear to be a special group, and are probably not representative for the general female population.

Although extramarital relationships were reported much more commonly than for instance in the U.K.,[8] similar rates of having extramarital sexual partners have been reported from Uganda,[25] Zaire,[20 26] Zimbabwe,[27] Ghana,[21] and other countries in Africa.[22]

Many more men had sexual intercourse in the past month with steady than with casual partners (although over the past year these proportions did not differ). As relationships with steady partners usually last less than two years, steady partnerships may contribute substantially to the overall rate of sexual partner change and therefore to the risk of acquiring HIV or other sexually transmitted diseases. This implies that condom promotion needs to be expanded beyond groups such as commercial sex workers and their clients.

No association was found between age group and having multiple partners, contrary to findings in Europe, where having multiple partners was more frequently reported by young adults.[9 10] However, the types of partner vary with age, casual and steady partners becoming less common and spouses more

common with increasing age (data not shown). Having had multiple partners in the past month was more often reported by men with less education and a low income. This is in contrast to previous reports from African countries,[22] where a higher level of education was associated with more often having had casual partners in the past 12 months. Perhaps behaviour has changed in those with more education, although response bias can not easily be ruled out: respondents with more education might have been more receptive to health education and have answered questions accordingly, without necessarily having changed behaviour. HIV-1 infection was not associated with level of education or income (data not shown). This is consistent with a higher risk in the past and a lower risk at present for better educated men.

Only 3% of male and female respondents had used a condom in the past month. Condoms were used mostly with casual partners, much less with steady partners, and least of all with spouses. However, even with casual partners, condoms protected only 18% of the sexual contacts which took place in the past month. This low use of condoms was not unexpected.[6 28 29] However, the data suggest that condom use has increased recently: condoms were used more by the young, better educated, and those having been born in high risk Regions. The increased condom use by the young and better educated has also been described in The Gambia.[30] The increased condom use in those with higher incomes may have been partly due to fewer economic barriers to condom use for this group. Unfortunately, groups with low education and income were not only more likely to report having had multiple sexual partners, but also less likely to report having used condoms. This group should be a priority for intervention.

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1 Piot P, Laga M, Ryder R, *et al.* The global epidemiology of HIV infection: continuity, heterogeneity, and change. *J AIDS* 1990;**3**:403–12.
2 Piot P, Plummer FA, Mhalu FS, Lamboray JL, Chin J, Mann JM. AIDS: an international perspective. *Science* 1988;**239**:573–9.
3 Rwandan HIV seroprevalence study group. Nationwide community-based serological survey of HIV-1 and other human retrovirus infections in a Central African country. *Lancet* 1989;**i**:941–3.
4 Killewo J, Nyamuryekung'e K, Sandström A, *et al.* Prevalence of HIV-1 infection in the Kagera region of Tanzania: a population-based study. *AIDS* 1990;**4**: 1081-5.
5 Serwadda D, Wawer MJ, Musgrave SD, Sewankambo NK, Kaplan JE, Gray RH. HIV risk factors in three geographic strata of rural Rakai District, Uganda. *AIDS* 1992;**6**:983–9.
6 Barongo LR, Borgdorff MW, Mosha FF, *et al.* The epidemiology of HIV-1 infection in urban areas, roadside settlements and rural villages in Mwanza Region, Tanzania. *AIDS* 1992;**6**:1521–8.
7 Laga M, Nzila N, Goeman J. The interrelationship of sexually transmitted diseases and HIV infection: implications for the control of both epidemics in Africa. *AIDS* 1991;**5(suppl 1)**:S55-S63.
8 Johnson AM, Wadsworth J, Elliott P, *et al.* A pilot study of sexual lifestyle in a random sample of the population of Great Britain. *AIDS* 1989;**3**:135–41.
9 Johnson AM, Wadsworth J, Wellings K, Bradshaw S, Field J. Sexual lifestyles and HIV risk. *Nature* 1992;**360**: 410–2.
10 ACSF investigators. AIDS and sexual behaviour in France. *Nature* 1992;**360**:407–9.
11 Nnko S, Mwanga J, Varkevisser C, *et al.* Risk perception and behavioural change in relation to AIDS—An exploratory study among factory workers in Mwanza town, Tanzania. In: Dantzenberg M, Nnko S, Chiduo B, *et al. Action Research for the Development of Interventions to Reduce HIV Transmissions in Mwanza Region, Tanzania.* Amsterdam. KIT Press (in press).
12 Armitage P, Berry G. *Statistical Methods in Medical Research.* 2nd Ed. Oxford: Blackwell Scientific Publications, 1987:429–33.
13 McQueen D. Understanding sexual behaviour. *AIDS* 1992;**6**:329–30.
14 Coates RA, Calzavara LM, Soskolne CL, *et al.* Validity of sexual histories in a prospective study of male sexual contacts of men with AIDS or an AIDS related condition. *Am J Epidemiol* 1988;**128**:719–28.
15 James NJ, Bignell CJ, Gillies PA. The reliability of self-reported sexual behaviour. *AIDS* 1991;**5**:333-6.
16 Upchurch DM, Weisman CS, Shepherd M, *et al.* Interpartner reliability of reporting of recent sexual behaviors. *Am J Epidemiol* 1991;**134**:1159–66.
17 Seage GR, Mayer KH, Horsburgh CR, Cai B, Lamb GA. Corroboration of sexual histories among male homosexual couples. *Am J Epidemiol* 1992;**135**:79–84.
18 Wilson D, Chiroro P, Lavelle S, Mutero C. Sex workers, client sex behaviour and condom use in Harare, Zimbabwe. *AIDS Care* 1989;**1**:269–80.
19 Pickering H. Asking questions on sexual behaviour . . . testing methods from the social sciences. *Health Pol Plann* 1988;**3**:237–44.
20 Bertrand JT, Makani B, Hassig SE, *et al.* AIDS-related knowledge, sexual behaviour, and condom use among men and women in Kinshasa, Zaire. *Am J Public Health* 1991;**81**:53–8.
21 Neequaye AR, Neequaye JE, Biggar RJ. Factors that could influence the spread of AIDS in Ghana, West Africa: knowledge of AIDS, sexual behavior, prostitution, and traditional medical practices. *J Acq Imm Def Syndr* 1991;**4**:914–9.
22 Carael M, Cleland J, Adeokun L, and Collaborating Investigators. Overview and selected findings of sexual behaviour surveys. *AIDS* 1991;**5(Suppl)**:S65-S75.
23 Halsey NA, Coberly JS, Holt E, *et al.* Sexual behaviour, smoking, and HIV-1 infection in Haitian women. *JAMA* 1992;**267**:2062–6.
24 Forman D, Chivers C. Sexual behaviour of young and middle aged men in England and Wales. *BMJ* 1989; **298**:1137–42.
25 Müller O, Barugahare L, Schwartländer B, *et al.* HIV prevalence, attitudes and behaviour in clients of a confidential HIV testing and counselling centre in Uganda. *AIDS* 1992;**6**:869–74.
26 Ryder RW, Ndilu M, Hassig SE, *et al.* Heterosexual transmission of HIV-1 among employees and their spouses at two large businesses in Zaire. *AIDS* 1990;**4**:725–32.
27 Bassett MT, Latif AS, Katzenstein DA, Emmanuel JC. Sexual behaviour and risk factors for HIV infection in a group of male factory workers who donated blood in Harare, Zimbabwe. *J Acq Imm Def Syndr* 1992;**5**:556–9.
28 Goldberg HI, Lee NC, Oberie MW, Peterson HB. Knowledge about condoms and their use in less developed countries during a period of rising AIDS prevalence. *Bull Wrld Hlth Org* 1989;**67**:85–91.
29 Forster SJ, Furley KE. 1988 public awareness survey on AIDS and condoms in Uganda. *AIDS* 1989;**3**:147–54.
30 Wilkins HA, Alonso P, Baldeh S, *et al.* Knowledge of AIDS, use of condoms and results of counselling subjects with asymptomatic HIV2 infection in The Gambia. *AIDS Care* 1989;**1**:247–56.